

SHARKARA

APRIL - JUNE 2019

VOLUME-50, No. - 02



NATIONAL SUGAR INSTITUTE

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SHARKARA

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IT CONTAINS.....

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FROM DIRECTOR'S DESK.....



Today the sugar factories in the subtropical region, Uttar Pradesh, in particular, may be better off due to good recovery levels, better sugar & ethanol prices but must look ahead for 10 years from now. The sugar mills and the farming community should continue to work together in order to increase farm-level productivity by implementing the latest agro-techniques for sustainable farming.

In the present scenario, it's not only about sugar, but co-products are equally important. Bagasse is an important fuel for firing the co-generation units of the sugar factories that not only provide clean power but also help in generating revenue. Ethanol, which is produced from molasses, helps in saving billions of dollars of the Government and at the same time supports clean energy agenda of the country. The revenue generated from the co-products further help the sugar factories in supporting the farmers in timely payment and running sugarcane development programs. The contribution from co-products is increasing day by day in the total sugar business realization. The Central Government's focus on Ethanol under National Biofuel Policy is paving the way for additional diversion of sugarcane/sugar to ethanol production through direct sugarcane juice, partial sugarcane juice and B-heavy molasses, presently being used for sugar production.

The Financial support provided by the Central Government to sugar mills for setting up new distilleries and expanding existing distilleries in the form of soft loans will bear approx. 50% of the interest cost. This would also generate additional employment & income for the rural sector. The Government's recent initiative towards setting up of Bio-CNG plants in the country to provide additional revenue generation for sugar factories while keeping the environment cleaner.

The Government, millers, farmers, scientists and other stakeholders of the sugar industry should work together in order to keep pace with the rapidly changing industry dynamics so as make this industry self-sustainable while enhancing the income generation of the farming community. Diversification is important for sustainability, I reiterate that sugar factories need to develop out of box thinking and developing innovative technologies in collaboration with technical institutes for value addition and thus profitability and sustainability of the sugar industry.

(Narendra Mohan)
Director

OUR PROVISIONS:

ANNUAL CONVENTION ORGANIZED:

4th Annual Convention of North Indian Sugarcane & Sugar Technologists' Association (NISSTA) organized at NSI, Kanpur on 29-30th May, 2019 concluded with provoking lectures & 06 nos. of informative presentations from institute on innovative processes and technologies followed by colorful cultural programme.



Eminent experts, Prof. Ross Broadfoot, Sugar Research Institute, Australia, Mr. Ahmed Vawda, Plant Executive Director (Sugar), Saudi Arabia and Dr. Keerthipala, Director, Sugarcane Research Institute, Sri Lanka delivered lectures on important aspects of sugar processing & sugarcane price fixation mechanism.

WORKSHOP ORGANIZED:

National Sugar Institute, Kanpur jointly with Bharatiya Sugar organized two days workshop at Kolhapur on 03-04th May, 2019 on technical issues relating to productivity enhancement in distilleries & use of alternate feed stocks. Matters relating to effluent treatment to achieve ZLD through various modes were also discussed.



OUR FELICITATIONS:

1. Director, National Sugar Institute Conferred with **“Innovative Leader of Asia Award-2019”** during the 3rd Asian Leadership Summit being organized at Thimphu, Bhutan from 18 -22nd June 2019.



2. Director, National Sugar Institute conferred with '**Outstanding Academic Leader of the Year 2019**' award by Centre for Education Growth & Research for institute's contribution in education, skill and research.



3. Dr. V.P. Srivastava, Asstt. Prof. Organic Chemistry conferred with **“Young Scientist Award”** in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists' Association (NISSTA) organized at NSI, Kanpur on 29-30th May, 2019

INTERACTIVE SESSION ORGANIZED:

An interactive session for 20 IAS Probationers was organized at the institute on 28th June, 2019. During the session a presentation was given on **"Issues related to sugarcane production, milling, marketing management, cost and sugar recovery"**. Director and other senior faculty members briefed them about various aspects relating to policy, productivity and need for product diversifications. Matters related to environmental, sugarcane procurement and sugar price fixation mechanism were also discussed during the interactive session. The participants also gathered knowledge on utilization of various by products of the sugar industry and their impact on revenue generation. The probationers also

visited various laboratories including Bureau of Sugar Standard to know process of preparation of sugar standard grades.



EXECUTIVE DEVELOPMENT PROGRAMME:

Three days "**Executive Development Programme**" was organized at the institute from 26-28th June, 2019. Senior officials from sugar factories & distilleries situated in UP, Bihar, Maharashtra, Karnataka, Gujarat and Haryana participated in the programme. Lectures on sugar policy, human resource, value addition, sugarcane & sugar productivity and on environmental issues were given by institute & faculty from other reputed institutes viz. IIT & IISR etc.



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OUR RESEARCH AREAS:

The Institute is actively involved in the collaborative endeavors with the sugar and allied industries for developing innovative techniques and technologies for improving the overall profitability of the sugar industry.

The Institute during the period took up R&D work on the following:

RESEARCH:

1. Utilization of potash rich ash for production of valuable bio fertilizer-Boiler ash from Incineration Boilers installed in molasses based distilleries can be used as carrier for making bio-fertilizer. Data on field trial of urad was compiled and submitted as thesis by one scholar. Further studies on viability of prepared Bio fertilizers (Rhizobium; PSB & Azatobacter) with new bioferilizer was done. Further, field trials will be taken up to test their efficacy on different crops.



2. Utilization of bagasse as dietary fiber- Studies on characteristics of bagasse as food supplements were taken up. Value added formulation was tried by incorporating bagasse fiber for bakery products and other traditional foods. Studies on shelf stability of all the value added products will be carried out by using suitable packaging materials.



3. Production of CNG from Filter Cake– With an aim to utilize the filter cake for production of Bio-CNG, different combinations of filter cake, farm yard manure and spent wash were initially tried on laboratory scale & then a small pilot plant was developed. Initial steps for making pilot plant at hostel using agri. and kitchen waste have been taken up. At the same time isolation of 35 microflora was carried out using faeces material, cow saliva, cow dung, sludge etc. Purification is under process, once the inoculum is made ready, it will be tested for its efficacy on production of methane gas.



4. Studies on the feasibility of utilization of sugarcane bagasse as a potential feedstock to access cosmetic ingredients– The study aims at valorization of pentose sugars of bagasse. After validation of the character of the derived product to be used as cosmetic ingredient, the studies related to scale up the trials to validate the method along with the economics of the production are under process.

5. Studies on synthesis of glycosidic surfactants using by-product resources of sugar industry – Studies have been further taken up so as to enhance the yield of bagasse derived polypentosides based surfactant along with reduction in purification steps involved thereof. The material balance for the developed method based on 100 g scale to access the surfactant and related experimental works for characterization are in progress.

6. Studies on conversion of waste water from sugar industry into suitable water resource- The study is aimed at developing a cost effect process for conversion of surplus water from sugar industry into suitable water resource including converting it to potable quality water. Various permutations and combinations of physico-chemical treatments have been tried with encouraging results.



7. Studies on pot efficient synthesis of alkyl levulinates (Als) using sugarcane bagasse derived cellulose –This study has been taken up with an aim to isolate cellulose (to be used as starting material) from bagasse, experiments have been carried out to fractionate hemicelluloses and lignin (three steps process).The characterization of these products via FT-IR has been completed. Now exploratory reaction is to be put from isolated compounds.



8. Studies on Mechanical clarification of juice –This research work has been taken up with a view to minimize use of chemicals for production of white sugar. Literature survey was carried out for further experiments on mechanical clarification to reduce the lime and sulphur consumption during sugar manufacturing process.

9. Studies on mixing of brine reject in final molasses –Brine recovery and disposal of brine reject is an area of concern from environment angle in sugar refineries. Experiments were carried out to assess the effect of addition of brine reject in molasses with respect to its quality i.e. sugar content & fermentability etc.

10. Studies on Development of Super short retention time clarifier –With an aim to reduce retention time in clarifier, modified design having inclined surfaces for mud settling has been developed. The initial results shows promise as the quality of clear juice obtained was found comparable or better than that from conventional clarifier. Further trials will be carried out with some modifications in the existing design.

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RESEARCH PAPERS/ POSTER / PRESENTED / PUBLISHED/ SENT FOR PUBLICATION:

1. **“Bioenergy from Filter Cake”** by Narendra Mohan presented during National Seminar jointly organized by SNSI & NSI on 12th April, 2019 at Belagavi, Karnataka.
2. **“Biomass Energy from Sugar Industry”** by Narendra Mohan & A.K. Kanaujia presented during National Seminar jointly organized by SNSI & NSI on 12th April, 2019 at Belagavi, Karnataka.
3. **“A Novel Multi-level SVPMW Scheme for High Power Induction Motor Drive Applications”** by Anoop Kumar Kanaujia, Sanjiv Kumar & D. Swain published in International Conference on Academic Science and Engineering (ICASAE – 2019) held on 7-8th June, 2019 at Lucknow.
4. **“Effect of Potassium Application on Nutrient Uptake, Yield and Quality of Sugarcane & Sustainable Soil Health”** by Ashok Kumar, Lokesh Babar, Narendra Mohan & Surinder Kumar Bansal sent for publication in Indian Journal of Fertilizers to be published in July, 2019.
5. **“Mechanical Clarification of Cane Juice with the Help of High Speed Centrifuge Machine”** by Mohit Kumar, Subhash Chandra, A.K. Garg & Narendra Mohan published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists’ Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.
6. **“Observation on Working of Super Short Retention Time Clarifier”** by M. Mandal & A.K. Shukla published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists’ Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.
7. **“Green Power, An Unexploited Potential in Indian Sugar Industry – A Review”** by Narendra Mohan & Anoop Kumar Kanaujia published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists’ Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.
8. **“A Novel Effluent Treatment Process for Plantation White Sugar Factories”** by Amresh Pratap Singh, Mahendra Yadav & Narendra Mohan published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists’ Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.
9. **“Real Time Monitoring for Efficient Water management”** by Brajesh Singh, Mahendra Pratap Singh & Virendra Kumar published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists’ Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.
10. **“Integrated Nutrient Management for Maximum Economic Yield of Sugar Beet and Sustainable Soil Health”** by Ashok Kumar, Lokesh Babar & Tej Pal Verma published in 4th Annual

Convention of North Indian Sugarcane & Sugar Technologists' Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur.

11. **“Bio-Energy from Filter Cake”** by Sanjay Awasthi, Seema Paroha & Narendra Mohan accepted for publication in 77th Annual Convention and International Sugar Expo of Sugar Technologists' Association of India to be held on 17-19th July 2019 at Kolkata.

2. **“Utilization of Sugarcane Bagasse as Dietary Fibre”** by Neelam Chaturvedi, V. P. Srivastava, Seema Paroha & Narendra Mohan accepted for publication in 77th Annual Convention and International Sugar Expo of Sugar Technologists' Association of India to be held on 17-19th July 2019 at Kolkata.

13. **“Moisture Reduction in Bagasse with Minimum Investment”** by Sanjay Chauhan & Narendra Mohan sent for publication in the proceedings of the 7th symposium of Bharatiya Sugar 2019 at Kolhapur.

14. **“Cane Juice Centrifugation for Superior Quality Sugar”** by Mohit Kumar, Subhash Chandra, A.K. Garg & Narendra Mohan sent for publication in the proceedings of the 7th symposium of Bharatiya Sugar-2019 to be held at Kolhapur.

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➤ BUREAU OF SUGAR STANDARDS:

The Institute on behalf of Bureau of Indian Standards prepares and issues Sugar Standard Grades to the entire Sugar Industry of the country for every sugar season. These Sugar Standard Grades are issued to facilitate quality control and to protect the interest of the common consumers. On the basis of these grades, sugar factories mark their produce accordingly.

On the basis of the approved Standards, Bureau of Sugar Standards Grades distribution commenced from 1st October, 2018.

Price schedule for the sugar season 2018-19:

1	Sugar Standard Grades to be issued	L-31, L-30, M31, M-30, S-31, S-30 & SS-31
2	Set of New Sugar Standard Grades containing 7 grades +3 empty glass bottles + 3 Velvet Cork in packing case	Rs.15000/= each set
3	Single Sugar Standard Grade	Rs.1900/= each
4	Empty Sugar Standard Glass Bottle	Rs.325/= each
5	Packing case	Rs.485/= each
6	Velvet Cork	Rs.80/= each
7	Postal expenses, forwarding charges, if any	Extra as applicable
8	Demand Draft to be sent	In favour of Director, National Sugar Institute , payable at Kanpur
9	Delivery of Sugar Standard Grades	Monday to Friday (10.00 AM to 5.00 PM)
10	Taxes	GST extra as applicable @18%. See SSOP

The institute has taken up revision of various existing BIS standards viz. molasses tanks, raw, plantation white, refined and icing sugar etc. on behalf of Bureau of Indian Standards. BIS standards for some other sugars viz. organic sugar, brown sugar & low sulphur sugar are being drafted.

➤ OUR ADVISORY:

Besides conducting teaching and training programmes, carrying out research in relevant field, another main function of the institute is:

1. To function as a “Think-tank” to sugar and allied industry for proposing modernization and trouble free functioning of the process on advisory basis / through Extension Services.
2. To formulate strategies and promotes measures for expansion of capacities, energy conservation, co-product utilization etc. for sugar and allied industries.
3. To assist Govt. of India through technical contribution in policy formulation and control of Sugar Industry.

CONSULTANCY SERVICES:

During April – June, 2019 consultancy services were provided to the following:

1.	M/s Ninaidevi Sakhar Karkhana, Distt - Sangli, Maharashtra.
2.	M/s Piccadily Agro Industries Ltd., Distt – Karnal, Haryana.
3.	M/s Meham Co-operative Sugar Mills Ltd., Meham, Distt – Rohtak, Haryana.
4.	M/s Bannari Amman Sugars Ltd., Distt – Coimbatore, Tamil Nadu.
5.	M/s Integrated Casetech Consultants Pvt. Ltd., Nodia, U.P.
6.	M/s Globus Spirits Ltd., Distt – Vaishali, Bihar.
7.	M/s DSCL Sugar, Hariawan, Distt – Hardoi, U.P.
8.	M/s MRN Cane Power (India) Ltd., Distt – Bagalkot, Karnataka.
9.	M/s U.P. State Sugar Co-operation, Unit – Mohiuddinpur, Distt – Meerut, U.P.
10.	M/s Dhampur Sugar Mills Ltd., Dhampur, Distt – Bijnor, U.P.
11.	M/s Dalmia Bharat Sugar Mills Ltd., Unit – Nigohi, Distt - Shahjahanpur, U.P.
12.	M/s Jamkhandi Sugars Ltd., Distt – Bagalkot, Karnataka.

13.	M/s B.K. Agrawal & Associates, Distt – Indore, M.P.
14.	M/s Simbhaoli Sugars Ltd., Unit – Chilwaria, Distt – Bahraich, U.P.
15.	M/s Sanjivani Sahakari Sakhar Karkhana Ltd., Goa.
16.	M/s The Kaithal Co-operative Sugar Mills Ltd., Distt – Kaithal, Haryana.
17.	M/s U.P. State Sugar Corporation Ltd., Unit – Mohiuddinpur, Distt – Meerut, U.P.
18.	M/s Palwal Coop. Sugar Mills Ltd., Palwal, Haryana.
19.	M/s Tikaula Sugar Mills Ltd., Distt – Muzaffarnagar, U.P.
20.	M/s Avadh Sugar & Energy Ltd., Unit – Seohara, Distt – Bijnor, U.P.
21.	M/s Mysore Sugar Company Ltd., Bangalore, Karnataka.
22.	M/s Uttam Sugar Mills Ltd., (Distillery Division), Barkatpur, Distt – Bijnor, U.P.

ANALYTICAL SERVICES:

The institute now has a Centralized NABL Accredited Analytical Laboratory to carryout analysis of sugar, molasses, alcohol and other related products as ICUMSA and other standards protocol. During the period, analytical services were rendered to following:

1.	M/s The Kisan Sahakari Chini Mills Ltd., Badaun, U.P.
2.	M/s Dalmia Bharat Sugar Mills Ltd., Unit – Nigohi, Distt - Shahjahanpur, U.P.
3.	M/s The Kisan Sahkari Chini Mills Ltd., Sathiaon, Distt – Azamgarh, U.P
4.	M/s The Vellore Co-operative Sugar Mills Ltd., Katpadi, Distt – Vellore, Tamil Nadu.
5.	M/s D.S. 8 Subramaniya Siva Co-operative Sugar Mills Ltd., Gopalpuram, Tamil Nadu.

The samples of sugar, molasses, ethanol, waste waters & condensates etc. were analyzed for the desired parameters in the NSI-Analytical Laboratory (NABL Accredited).

OUR OTHER ACTIVITIES:

1. Director, National Sugar Institute, delivered a lecture on **“Sugar Quality Improvement”** for delegates from Indonesia at Simbhaoli Sugars Ltd on 13th April, 2019.



2. **“Earth Day”** was celebrated on 22nd April, 2019 in support for environmental protection at the institute. Tree plantation and oath taking for conserving natural resources and minimizing waste generation was done on this occasion.



3. NSI signed MoU with CSJM University, Kanpur to carryout collaborative research work on areas of mutual interest viz. bio-energy, bio-fuel, effluent treatment and also on exchange of faculty, conducting personality development programmes for students etc.



4. Scientist's of M/s Tata Chemicals Ltd. visited the institute to seek assistance on production of fortified sugars through co-crystallization technique.



5. **"World Environment Day"** was celebrated on 5th June 2019 on the theme **"Air Pollution"**. On this day newly constructed "Children Park" was handed over to the tiny-tots.



6. Advisory board meeting under the Chairmanship of Joint Secretary (Sugar & Administration) held on 07th June, 2019. On this occasion, Environment Science Laboratory was also inaugurated.



The laboratory has been specifically developed for the students of Environment Science & Quality Control so as to perform analysis of water & waste waters etc. as per standard protocols.

7. Hon'ble State Minister Agriculture, Shri Ranvendra Pratap Singh inaugurated the Innovative **"Farmer's Meet"** at the institute organized by CII with NSI as Institutional partner on 18th June, 2019.



Hon'ble Minister stressed the need for enhancing the farm productivity with minimum inputs. He also highlighted the importance of organic farming & subsequent organic products for achieving value addition. He called upon the farmers to form small groups to facilitate direct selling of their produce in market for better price realization.

8. Entrance Examination -2019, successfully conducted at six centers across the country. The results of most of the courses were declared.

9. 300 KW Grid Connected Roof Top **"Solar Power Plant"** finally became operational at institute during the period. The plant is being operated on RESCO mode. Institute plans to further extend the capacity.

सौर ऊर्जा से जगमगाया राष्ट्रीय शर्करा संस्थान



सौर ऊर्जा से जगमगाया राष्ट्रीय शर्करा संस्थान।

फोटो : एसएनबी

कानपुर (एसएनबी)। जीटी रोड पर कल्यानपुर स्थित राष्ट्रीय शर्करा संस्थान शुक्रवार को सौर ऊर्जा के प्रकाश से जगमगा उठा। संस्थान में स्थापित 300 किलोवाट के रूफ टॉप ग्रिड कनेक्टेड सौर ऊर्जा संयंत्र का शुभारंभ निदेशक डॉ.नरेन्द्र मोहन ने किया। सौर ऊर्जा का उपयोग किये जाने से संस्थान को प्रति वर्ष लगभग ₹ 20 लाख की बचत होगी।

शर्करा संस्थान में सौर ऊर्जा संयंत्र में एज्योर पावर रूफ टॉप वन

प्रा.लि., नई दिल्ली द्वारा रेस्कॉ मोड में स्थापित किया गया है। अनुबंध के तहत उक्त कंपनी को केवल ₹ 3.91 प्रति यूनिट की दर से विद्युत उपभोग का भुगतान किया जाएगा। संस्थान का वर्तमान में लगभग ₹ 10 प्रति यूनिट की दर से विद्युत उपभोग का भुगतान केस्को को करना पड़ता है। निदेशक नरेन्द्र मोहन ने बताया कि भविष्य में संस्थान परिसर में नवनिर्मित भवनों एवं होस्टल की छतों पर भी सौर ऊर्जा संयंत्र स्थापित करा क्षमता 500 किलोवाट तक किये जाने की योजना है।

HAPPENING IN THE SUGAR INDUSTRY:

Uttar Pradesh: Farmers, mill workers stage protest over pending payment of sugarcane in UP's Basti.

Several half naked farmers and mill workers staged protest over pending payment of sugarcane in Uttar Pradesh's Basti district. They have been protesting since last five days. The workers are demanding for the right price of sugarcane, employee's salary and sugar mill to start on the time.

PMO asks Finance Ministry to release funds to sugar mills.

After a workers' strike in sugar mills over delayed wages in the electorally important western Uttar Pradesh, the Prime Minister's Office has stepped in to ask the finance ministry to ensure quick disbursement of interest subsidy on sugar sector loans.

Source says India to sell 30,000 tn raw sugar to refineries in China.

Sugar exports from India, which had come to a standstill, may see a revival soon as refineries in China have placed an order for 30,000 tn of raw sugar from India, an industry source said. "China has already bought 30,000 tn of raw sugar from India, and they want to buy 30,000 tn.

Uttar Pradesh: Over 2 lakh sugarcane growers may get three years' interest on pending dues.

More than two lakh cane growers in Pilibhit can now expect to get a handsome sum in the form of accumulated interest on pending cane dues from 2012-13 to 2014-15 from the state government after cane commissioner Sanjay R. Bhoosreddy filed an affidavit of compliance before a single judge bench of Justice.

Uttar Pradesh: Sugarcane farmers perturbed over delay in payment, seek govt. support. With elections around the corner, political parties are leaving no stone unturned to woo different sections of voters. However, Shamli may prove to be tough as discontent is ripe among sugarcane farmers over a delay in payment.

Small and medium sugar millers' margins will get sweeter: CRISIL.

Small and medium sugar mills will see a marked improvement in profitability because of the hike in the minimum support price (MSP) for sugar and other government measures. The central government raised the MSP from Rs 29 per kg to Rs 31 in February 2019.

Sugarcane farmers in Western Maharashtra facing losses, factories struggling to function.

In yet another example of the failure of government's agricultural policies, rich sugar belt farmers in western Maharashtra are facing losses. Sugar factories are struggling to function while farmers have to protest to get fair and remunerative price (FRP).

Sugar production rises 3.0% to 321.19 lakh tonnes in Oct-April Sugar Season 2019: ISMA.

100 sugar mills are crushing sugarcane on 30 April 2019, as per the data from Indian Sugar Mills Association (ISMA), sugar mills across the country have produced 321.19 lakh tonnes of sugar between 1 October 2018 and 30 April 2019.

Tamil Nadu to get new high-yielding sugarcane variety soon.

The Sugarcane Breeding Institute (SBI) in the city has developed a new variety of sugarcane, which is expected to give better returns in shorter duration. Called Co 11015, the new variety has been found to have about 2% more sucrose content than Co 86032, the variety widely used now.

UP to press private sugar mills to pay farmers as arrears top Rs 10,000 cr.

With Uttar Pradesh sugarcane arrears standing firm at about Rs. 10,000 crore in the ongoing crushing season, the Yogi Adityanath government is likely to pressurize private sector mills to clear their respective outstanding.

Industry says 7 mlntn sugar export must in 19-20 for stable prices.

At a time when Indian market is flooded with excess sugar, there seems no way out other than exports to get rid of the surplus. Exports of 7-8 mlntn is a must in 2019-20 (Oct-Sep) in order to bring about stability in the domestic market, industry officials said.

Cane growers in Maharashtra get cold feet due to drought.

The sugarcane cultivation in Maharashtra is likely to decline due to drought in 26 districts in the state. The State government is collecting the data of cane cultivation for decline in cane cultivation.

Sugarcane farmers abandon jaggery for commercial crops.

The jaggery production in Visakhapatnam district is likely to come down at least by 50% compared with the last season. As a result of this, the arrival of jaggery at the Anakapalle jaggery market in Vizag district the second biggest market in the country has registered a downward trend.

Gujarat: Sugar mill moves Gujarat HC over sales quota.

A sugar mill from Vadodara has approached the Gujarat high court challenging the Centre's decision to fix sugar sales quota and for permission to sell the sweetener so that it can pay dues to sugar cane farmers.

Sugar sector stares at sweet 2019: 5 stocks surge over 40% this year.

Sugar stocks have been rallying this year and could further continue its momentum as Indian Sugar Mills Association has indicated that sugar production could rise 1.5 percent to a record 33 million tone.

The bitter sweet truth of sugarcane in Maharashtra.

Maharashtra is in the grip of another drought this year. Agriculture and other livelihoods are at stake for lakhs of households in about 4,920 villages and 10,506 hamlets. With relatively low irrigation coverage of around 18%, agriculture in Maharashtra is mainly dependent on rain.

Engineered Rhodococcusopacus produces high yields of biodiesel from glucose.

Researchers the Korea Advanced Institute of Science and Technology (KAIST) have presented a new strategy for efficiently producing fatty acids and biofuels that can transform glucose and oleaginous microorganisms into microbial diesel fuel, with one-step direct fermentative production.

USA – Reallocation of TRQ for sugar imports for 25 countries announced.

The Office of the U.S. Trade Representative (USTR) on June 24 announced the reallocation of 100,071 tonnes, raw value, of the World Trade Organization tariff rate quota (TRQ) for imported raw sugar for the current fiscal year.

Thailand – Cambodian farmers file lawsuit against MitrPhol for alleged land grab.

The multinational Thailand-based sugar giant Mitr Phol is facing a lawsuit filed on behalf of about 3,000 people who were allegedly evicted from their farm holdings in Cambodia.

Pakistan – 15 sugar companies contribute 59% of sales tax from the sector.

The World Bank and Pakistan's Federal Board of Revenue (FBR) have analysed the tax gap of three powerful sectors sugar, cement and steel and estimated that tax collection could go up by PKR100

billion -150 billion (US\$636 million-954 million) on per annum basis with realisation of true potential.

Canada – New build micro sugar refinery commences operations at the port of Hamilton.

Sucro sourcing recently announced the completion of its new micro sugar refinery in Hamilton. The refinery was completed with the support of the Port of Hamilton and has commenced operations.

USA – Corn growers’ cheers lifting of summer ethanol ban.

The Trump administration lifted restrictions on the sale of higher ethanol blends of gasoline on 31st May, keeping a campaign promise to farmers suffering from the trade war with China but drawing a legal threat from the oil industry and environmental groups.

Australia – Nordzucker purchase of Mackay Sugar needs to traverse one hurdle.

The sale of one of Australia’s largest and last remaining grower-owned sugar milling company Mackay Sugar to Nordzucker has moved a step closer, with the State Government committing AU\$14 million (US\$9.7 million) lifeline to facilitate the closure of a deal.

Germany – Sugar beet acreage down by 3%.

Sugar beet acreage in Germany is down by 2.8% to about 379,000 hectares this year, according to the WVZ German sugar industry association.

Brazil – Santa Adelia to close one of its three sugar mills in 2021.

The sugar and ethanol producer Usina Santa Adélia will close one of its three mills in Sao Paulo state in 2021 to cut costs and boost efficiency.

China – Drought in Yunnan Province reduced cane output by over 2 million tonnes.

Persistent drought in southwest China’s Yunnan Province has resulted in decreasing sugarcane output this year by 2.23 million tonnes, according to the provincial department of industry and information technology.

Tongaat Hulett to retrench 16% of its staff amidst financial crisis.

The financially beleaguered Tongaat Hulett, one of South Africa’s major sugar company with interests in Southern Africa, is planning to reduce its workforce by 5000.

Sugar trade dispute – Brazil drops complaint against China at WTO.

Brazil is dropping its formal complaint to the World Trade Organization (WTO) to investigate China's sugar trade policies, the Brazilian government said on 21st May.

Climate extremes explain 18%-43% of global crop yield variations.

Researchers from Australia, Germany and the US have successfully quantified the effect of climate extremes on global crop yield variations. They concluded that general extremes, like drought and heat waves that have occurred during the growing season of crops such as maize, rice, and soy accounted for 20% to 49% of yield fluctuations.

Philippines – New VMC's US\$38 mln cogen unit inaugurated.

Top government officials, including President Rodrigo Duterte, have lauded the opening of the 40 MW bagasse-based cogeneration plant in Victorias City owned by Victorias Milling Company (VMC).

Brazilian mills to cut cane allocation for sugar production.

Brazilian mills are expected to cut cane allocation for sugar production in the 2019-20 crops, diverting more cane to ethanol output, amid low sugar prices and strong local demand for the biofuel.

Brazil- Sugar output in first half of May'19.

As per the data released by UNICA, CS Brazil sugar mills crushed 38.631 mn tons of sugarcane in first half of May 2019, down 9.71% from 42.78 million tons crushed last year in the same fortnight.

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➤ RESEARCH ARTICLE:

“ROLE OF FALLING FILM EVAPORATORS & VERTICAL CONTINUOUS PANS (FOR ALL MASSECUTE BOILING) IN REDUCING THE STEAM CONSUMPTION .PAN BOILING WITH 3RD VAPOURS VS 4TH VAPOURS. DESIGN ASPECTS & OPERATIONAL FEASIBILITY”.

By

Sura. K. Bhojaraj

ABSTRACT

Here we have concentrated in minimizing the Steam consumption by adopting an effective evaporator scheme involving Falling film Evaporators for all effects, in conjunction with Vertical Continuous pans for all massecuite boiling & adopting the application of Beet Sugar Industry like taking out last effect vapours at higher temperature (less vacuum) . This scheme is tried in Indian Sugar Industry in the recent past.

Further ,we have taken up two cases , one with 3rd effect bleeding for all massecuite boiling by using vertical continuous pans & the other with fourth effect bleeding for pan boiling. In first case Exhaust pressure is kept at 1.0 kg/cm².g@ 120 deg C. saturation temperature. While in second case the Exhaust pressure is kept at 1.25 kgs/cm².g @ 124 .5 deg C saturation temperature & last body vapours leaving at 85 deg C. Accordingly the juice heater bleeding pattern is varied to suite the conditions. In evaporator station condensate flash advantage is considered. Mechanical circulators to be considered in all compartments of Vertical continuous pans.

Important thing is to examine the operating quantities of juice ,to enable these sort of bleeding pattern to happen.

Automation for Evaporator station & Pan stations are considered.

The estimated steam consumption is 29 % in 1st case & 26 % in second case. The operational difficulty in second case is vividly narrated.

Key words:

VLJH (Vapour line Juice heater), DCH (Direct contact heater),FFE (Falling film evaporator),VKT (Vertical Continuous . pan) ,PTH (Plate type Heat Exchanger),JH (Juice heaters).H.S.A (Heating surface area), Pr.(Pressure) & Temp.(Temperature),ΔT(Temp. difference),S.J:Sulphited juice,.

Introduction

Now day, in order to reduce steam consumption as far as possible, attempts are made to boil pans with 3rd /4th vapours .

Here attempt is made to examine the system design & operational aspects of quintuple set evaporators in one case with FFE sets for first three effects & in second case with all effects of Falling film type & with vertical continuous pans with mechanical circulator in each module .

We have considered Quintuple system with application of various heat recovery devices & utilizing 3rd vapours for all massecuite boiling in one case & utilizing 4th vapours for A , B & for C boiling in second case.

The availability of Exhaust at comparatively higher pressure in Cogeneration plants from Extraction cum condensing turbines, enable continuous steady supply to evaporator station at a desired pressure. In second case we have chosen a Pressure of 1.25 kg/cm².g (124 degC, saturation temperature) & limiting the last effect vapours @ 85 deg C @0.58 kg/cm².abs to have a ΔT of 39 deg .C, results in rearrangement of bleeding pattern. For this application Quintuple effect is more suited than other schemes considering the vapour loading conditions .In both cases we have considered various heat recovery devices such as condensate flash recovery system, & replacing medium pressure & low pressure steam applications in Super heated wash water system, Sulphur burners ,Seed melting , Molasses conditioning & pan washing etc, brings down the steam consumption at evaporator station considerably. Concept of stand by /floating bodies are narrated ,to keep up sustained working through out the season.

Further ,we have considered 5000 TCD Sugar plant as a case study. The steam consumption in both cases are estimated.

Evaluation of heating surfaces in both cases is also done

Role of Falling film evaporators

In Falling film evaporators ,liquid & vapour flow downwards in parallel flow. The liquid to be concentrated is preheated to its boiling point. An even thin film enters tubes via an efficient juice distribution device above in top tube plate & situated in top part .The liquid falls in between ligaments of the tube arrangement. During that downward flow at boiling temperature ,it is partially evaporated. The gravity induced downward movement is increasingly augmented by concurrent vapour flow in the bottom part.

Falling film evaporators can be operated with very low temp. difference between heating media & the boiling juice & they also have very short product contact times ,typically just a few seconds/pass. This low temp. difference enable out let vapours at high temp ,which is beneficial for boiling in subsequent effects.

The tube heights are in the range of 8-12 meters depending on heating surfaces from 2000 -10000 m².It needs the wetting rate in the range of 18-20 L/hr cms to keep the calendria wetted with juice. It needs circulation pumps of 2-3 times feed rate & with 22-25 m head.

It is a self supporting structure the entire body rests on bottom skirt of sufficient height to locate various pumps under the body for ease of operation & maintenance.

Role of Vertical continuous pan

This continuous pan is designed to work with low pressure vapours for efficient massecuite boiling.

Various features :

Vertical Installation & does not need supporting structure.

Seven or more symmetrical Calendria for better massecuite quality. In built graining pan. Stainless steel wetted parts.

Top mounted circulator with VFD in all chambers. Compact mechanical seals.

Honeycomb Calendria for improved circulation. Induces increased heat transfer coefficients .Improved circulation because of Mechanical circulation & optimum down take diameter of 37% of calendria diameter

Considering the utilization of mechanical circulator, optimum tube height, level above top tube plate & optimum vapour space heights are estimated .

Operating pressure up to 700 mbar for high massecuite boiling & 600 mbar for low massecuite boiling.

Improved crystal yield, reduced incrustation & reduction in formation of conglomerates.

Cleaning during operation by isolation of individual chambers,

Inlet vapour control for individual chambers. Massecuite level & temperature measurements.

Efficient automation of all variables.

Case studies :

A) Here Exh. Pr. kept at same value 1.00 kg/cm².g ,but last effect @ 0.20 kgs/cm².a .This aspect enable to use first three effects of Quintuple of FFE type & use 3rd body vapours for pan bleeding

Corresponding calculation in case of Quintuple with suggested bleeding & operating conditions in case of 5000 TCD plant:

Crushing capacity: (5000/22 hrs/228 TCH)

M.J % Cane : 105 : 239.40 T/Hr, **Imbibition % Fibre 230+:**

Filtrate returns 10%: 22.8 T/Hr

Total load to JH's : 262.20TCH(115% on cane)

Cl.J% Cane 103% on cane: 234.84 T/hr.Brix 14.0,Cp (Sp.heat considered 0.92)

Syrup Brix : 62.00 : % Evaporation: 76

Massecuite % cane : A- 30/B-12/C-8 (50 % on cane)

Exh. Condition :1.00 kg/cm².g @ 120 deg C & vacuum in last body @ 0.2 kg/cm².g (60 deg C)

Pr & Temp.across each body in case of

Exh.at 2.00 kgs/cm².abs (120 deg C) &Last body @ 0.2 kg/cm².abs (60 deg C)

Exh pr	1 st	2 nd	3 rd	4 th	5 th
Kgs/cm ² /abs	1.604	1.226	0.866	0.524	0.20
Temp.deg.C	113.5	105	95.5	82.5	60
Latent heat kcl/kg	531.3	536.75	542.94	550.70	564.2

Bleeding pattern:

R.J Initial heating : 35 to 47 deg C by CVP out let vapours (VLJH) 4907 Kgs/hr

R.J 2nd heating from 47 to 57 deg C by Condensate heating (Horizontal heater)

R.J final/ correction heating from 57 -72 deg C by 4th body vapours :6570Kgs/hr

Juice load to S.J heating : 262200 kgs/hr

S.J 1st heating from 67-72 deg by condensate cross heating

S.J 2nd 1st heating from 72 to 93 deg by 3rd vapours (DCH) = 9304 kgs/hr

Juice load to S.J 3rd heating : 262200 + 9304 = 271504 (119.66% on cane)

S.J 3rd heating from 93 to 103 by 2nd vapours(DCH) = 4636Kgs/hr

Juice load to Clarifier : 271504+ 4636 = 276140 kgs/hr (121.08 % on cane)

From there flash losses (0.8%) 1824 kgs ,underflow (12%)27360 kgs/hr taken out .Added Bagacillo (0.8%) 1824 kgs . So clear juice coming out from Clarifier is 276140-1824+1824 -27360 =248840 kgs/hr 109.08 %

CL.J 1st heating by 2nd vapours 95 to 100 deg C by PHE = 2133 kgs/hr

CL. J 2nd heating by 1st vapour 100 to 111 deg C by DCH = 4718 kgs/hr

Clear juice load to Evaporators:

248840 + 4718 = 253558 kgs/hr(111.21 %) @ 12.966 Bx

Pan boiling : (Considering All massecuites are to be boiled by Vertical Continuous pans):

Vapour requirement: For A 0.3 kgs vapour / kg of massecuite ; for B 0.22kgs/kg & for C 0.25 kgs/kg.

228000 x 0.30 x0.3 = (20520 kgs/hr) for A –Massecuite (9.00 on cane)

228000 x 0.22 x 0.12 = 6019 kgs/hr for B massecuite (2.64 % on cane)

228000 x 0.25 x 0.08 = 4560 kgs/hr for C massecuite(2.0% on cane)

3rd effect vapour for A ,B & C – boiling including graining / footing

:31099 Kgs/hr (13.64 % cane)

Pan washing : 0.5 % cane 1140 kgs/hr by 2nd vapours

Seed melting by 1st vapours 1.0% ,2280kgs/hr

Molasses conditioning by 3rd vapours ,0.5%1140 kgs/hr

Steam for drier by 1st vapour : 0.1% = 228 kgs/hr

C/F washing by by 1st vapour 0.2 % = 456 kgs/hr

Total Evaporation in Quintuple:

253558 (62- 12.966) /62 = 200531 (79.08 %) kgs/hr .Syrup Quantity = 53027 kgs/hr (23.26 %)

$E = 200531 \text{ kgs/hr} = 5x + 4 (6570) + 3 (9304 + 31099 + 1140) + 2 (2133 + 4636 + 1140) + 2280 + 4718 + 228 + 456$

$X = 5224 \text{ kgs/hr} (2.53 \% \text{ on cane })$

Corresponding evaporation in kgs/hr in Quintuple :

I – 68928 / II – 61246 / III –53337 / IV –11794 /V- 5224 Kgs/hr

H.S.A 's considered I-2500 x1/II- 2500 /III- 3000 /IV -1000/V-1000 = 10000 m²

2500 FFE as floating body for I &II ,3000 FFE as std.by body for III, & 1000 R as Floating body for IV & V

Rate of evaporation: I- 27.12/II-24.50 III- 17.78/IV-11.80/V- 5.22 Kg/m²/hr

Exhaust requirement @ Evaporator station: 68928/ Kgs/hr(30.23 % cane)

30.23– 2.50 % Condensate flash advantage = 27.73 % cane

Overall steam consumption in case of configuration under study:

Evaporation steam demand 27.73 + Miscellaneous demand 0.5 % (less because of application of various heat recovery devices) + Losses 0.5 % = **28.73**, i.e **29 % on cane**

Evaporator station Configuration

To avoid stoppage of Evaporators for cleaning , the concept of floating bodies is recommended. One FFE of 2500 m² H.S.A for 1st & 2nd . Another FFE of 3000 m² fas std.by for 3rd effect . Last two effects have one floating R of 1000 m² area.

Evaporation I – 68928 / II – 61246 / III –53337 / IV –11794 /V- 5224 Kgs/hr

Rate of evaporation: I- 27.32/II-24.5/III- 17.78/IV-11.80V-5.22 Kg/m²/hr

B)2nd Case : Here Exh. Pr. kept at same value 1.25 kg/cm².g ,but last effect @ less vacuum i.e 0.58 kgs/cm².g.This aspect enable to use all effects of Quintuple of FFE type. All pan boiling by 4th vapours.

Pr & Temp. across each body in case of

Exh.at 2.25 kgs/cm².abs (124 deg C) & last body @0.578 kg/cm².abs (85 deg C)

Exh pr	1 st	2 nd	3 rd	4 th	5 th
Kgs/cm ² /abs	1.8822	1.5311	1.1967	0.879	0.578
Temp.deg C	118	112	104.5	96	85
Latent heat λ Kcal/kg	530	534.8	538.47	543.73	549.30

Corresponding process design calculation in case of Quintuple with suggested bleeding & operating conditions in case of 5000 TCD plant:

Crushing capacity: (5000/22 hrs/228 TCH)

M.J % Cane : 110 : 250.8 T/Hr, **Imbibition % Fibre 250+:**

Filtrate returns 10%: 22.8 T/Hr

Total load to JH's : 120% cane /273.60 T/hr

Cl.J% Cane 108% on cane: 246.24.Brix /13.5,Cp (Sp.heat considered 0.92)

Syrup Brix : 62.00 : % Evaporation: 78.22

Bleeding pattern:

R.J Initial heating : 35 to 47 deg C by CVP out let vapours (VLJH) : 5130 Kgs/hr

R.J 2nd heating from 47 to 60 deg C by Condensate heating (PHE)

R.J final/ correction heating from 60 -72 deg C by last body vapours :5499 Kgs/hr

S.J 1st heating from 67-75 deg by condensate cross heating

S.J 2nd heating from 75 to 93 deg by 4th vapours (DCH) =

$$228 \times 1000 \times 1.20 \times 0.92 \times (93-75)/(543.73+ 3) = 8287 \text{ kgs/hr}$$

Juice load to S.J 3rd heating : 273600 +8287 = *281887kgs/hr

S.J 3rd heating from 93 to 103 by 3rd vapours(DCH)

$$281887 \times 0.92 \times (103-93)/ (538.47 + 1.5)= 4803 \text{ kgs/hr}$$

Juice load to Clarifier : 281887+ 4803 = 286690 kgs/hr

From there flash losses (0.8%) 1824 kgs ,underflow (12%)27360 kgs/hr taken out .Added Bagacillo (0.8%) 1824 kgs . So clear juice coming out from Clarifier is 286690-1824+1824 -27360 =259330 kgs/hr 113.74 % @ 12.82 Brix

CL.J 1st heating by 3rd vapours 95 to 100 deg C by PTH = 2215 kgs/hr

Cl. J 2nd heating by 2nd vapour 100 to 109 deg C by DCH =3993 kgs/hr

Clear juice going to 3rd heating : 259330+ 3993 = 263323 kgs/hr

Cl. J Final heating by 1st vapour 109 to 116 deg C by DCH = 3188 kgs/hr

Clear juice load to Evaporators:

$$263323 + 3188 = 266511 \text{ kgs/hr (116.89\%) @ 12.47 Bx}$$

Pan boiling : (Considering All massecuites are to be boiled by Continuous pans):

Vapour requirement: For A 0.3 kgs vapour / kg of massecuite ; for B 0.22kgs/kg & for C 0.25 kgs/kg.

$$228000 \times 0.30 \times 0.3 = (20520 \text{ kgs/hr}) \text{ for A -Massecuite (9.00 on cane)}$$

$$228000 \times 0.22 \times 0.12 = 6019 \text{ kgs/hr for B massecuite(2.64 \% on cane)}$$

$$228000 \times 0.25 \times 0.08 = 4560 \text{ kgs/hr for C massecuite(2.0\% on cane)}$$

4th effect vapour for A,B &C – boiling including graining & footing

Vapour requirement (4th effect vapours) for C pan boiling = 4560 Kgs/hr/(2.0 % on cane) including grain/footing making .

$$4^{\text{th}} \text{ vapours for A\&B – boiling including Footing making :} 26539 \text{ Kgs/hr (11.64 \% cane)}$$

$$\text{Pan washing : } 0.5 \% \text{ cane } 1140 \text{ kgs/hr by } 2^{\text{nd}} \text{ vapours}$$

$$\text{Seed melting, by } 2^{\text{nd}} \text{ vapours } 1.0\% , 2280 \text{ kgs/hr}$$

$$\text{Molasses conditioning by } 3^{\text{rd}} \text{ vapours , } 1140 \text{ kgs/hr}$$

$$\text{Steam for drier by } 1^{\text{st}} \text{ vapour : } 0.1\% = 228 \text{ kgs/hr}$$

$$\text{C/F washing by } 1^{\text{st}} \text{ vapour } 0.2 \% = 456 \text{ kgs/hr}$$

Total Evaporation in Quintuple:

$$266511 (62- 12.47)/62 = 212908 (79.89) \text{ kgs/hr .Syrup Quantity = } 53603 \text{ kgs/hr (23.51\%)}$$

$$E = 212908 \text{ kgs/hr} = 5x + 4 (8287+26539+ 4560)) + 3 (2215+ 1140) + 2 (4803 +3993 +1140+ 2280) +3188+228+456$$

$$X = 3399 \text{ kgs/hr (3.30\% on cane)}$$

Corresponding evaporation in kgs/hr in Quintuple :

I – 62228 / II – 58356 / III – 46140 / IV – 42785 / V – 3399 Kgs/hr

H.S.A 's considered I-3500 x1/II-4000x1/III- 3500 x1/IV-4000 x2 /V-2000 = 21000 m²

Rate of evaporation :I- 15.78/II-14.82/III- 11.76/IV-4.892/V-2.15 Kg/m²/hr

Exhaust requirement @ Evaporator station: 62228/ Kgs/hr(27.29 % cane)

27.29– 2.50 % Condensate flash advantage = 24.79 % cane

Overall steam consumption in case of configuration under study:

Evaporation steam demand 24.79 + Miscellaneous demand 0.5% (less because of application of various heat recovery devices) + Losses 0.5 % = 25.79 i.e **26.00 % on cane**

Annexure II: H.S.A Distribution calculation : (in second special case) to consider.

Corresponding evaporation in kgs/hr in Quintuple :

I – 62228 / II – 58356 / III – 46140 / IV – 42785 / V – 3399 Kgs/hr

Rate of evaporation: I- 15.78/II-14.82/III- 11.76/IV-4.892/V-2.15 Kg/m²/hr

Comparison of overall steam consumption in case of straight Quintuple case I (with 3rd vapours for pans) & case II (with 4th vapours for A & B boiling & 3rd vapours for C boiling).

The steam saving of 29. % on cane in case I , when compared to 26 % in case II. A reduction of 3 % on cane.

For 5000 TCD plant & for 180 days of operation ,the net steam saving is,

$5000 \times 3 \times 180 / 100 = 27000$ tons/season

By taking conversion factor of 2.10 ,the equivalent bagasse saving is 12860 tons/season.

Taking a price of Rs 2500/ton of Bagasses , money realization is 322 **lakhs/season**

In terms of power produced in a Cogeneration plant :

$228 \times (3 / 100) \times 1000 / 7.50 \text{ kgs/kwhr} = 912 \times 24 = 21188 \text{ units/day} .$

Considering Rs 6.50 /unit ,per day realization is Rs 137722 .For a season of 180 days ,the corresponding realization is 248 **lakhs** .This is also quite attractive proposition. For extra heating surface of $21000 - 10000 = 11000 \text{ m}^2$. The manufacturing cost of Evaporators, including fittings & valves with S.S Tubes & Automation , works out to be 500 lakhs including Erection ,but excluding Supporting staging & piping. So the pay back period is within two seasons. This is the major benefit.

Evaporator station Configuration (in first case)

To avoid stoppage of Evaporators for cleaning , the concept of floating bodies is recommended. One FFE of 2500 m^2 H.S.A for 1st & 2nd . Another FFE of 3000 m^2 as std.by for 3rd effect. Last two effects have one floating FFE of 1000 m^2 area.

Evaporator station Configuration (in second case)

4000 FFE as floating body for I & II , 4000 FFE as floating body for III & IV , spare body of 2000 m^2 for V

In case of FFE sets ,the floating body will be taken into line ,whenever the regular body is isolated for C.I.P(cleaning in place).Usage of sulphomic acid & caustic soda followed by high pr. jet water cleaning is practiced.

Provision of Mechanical tube cleaning , w/o dismantling the top cover:

In one design, the top part above juice distribution is given sufficient head room ,so that ,entire ring of Juice distribution assembly is lifted up & hanged to Top cover, without opening it. Then Mechanical tube cleaning could be done.

In another design ,the top cover is bolted to top part .Debolt & tilt & raise the top cover by lever arrangement (as done in Juice heaters) ,for mechanical tube cleaning ,if necessary during the season ..

Automation:

VFD's are to be provided for Clear juice feed pump & recirculation pumps. Flow meters are to be provided for Clear juice inlet, recirculation duty & out let syrup. Flow control has to be provided for recirculation pumps.

Steam flow control & vapour stabilization systems have to be provided. Brix measurement of inlet juice & outlet syrup have to be provided. Brix control to be provided for out going syrup.

Condenser Automation is to be considered.

Pan station Configuration:

Considering all VKT (Vertical continuous pans) sets for massecuite boiling , for this capacity one needs 70 T/hr for A, 32 T/hr for B, & 20T/hr for C.

The design is of seven modules (2 for graining ,four for boiling & I for tightening)

We have suggested to have an improvised model incorporating mechanical circulator in all modules , considering these capacities. Tube lengths of 1200 mm are considered. With other optimum design parameters , will enable the pans to boil on 3rd vapours effectively under normal conditions & with pressure evaporation pan boiling will be on 4th vapours

Automation:

The automation in tightening zone include heating medium (vapour control) loop , hot water control loop, Brix indication loop (conductivity/RF based/ Micro wave transmitter etc)& condensate measurement). This is apart from regular automation being provided to boiling zone of CVP , which include Brix measurement & control for all compartments & correction for the last one , heating vapour control, ratio control for magma: molasses, absolute pressure control etc all based on PLC system , could be hooked to DCS of the plant Automation. The measurement of molasses/syrup & condensate is done .

Condenser Automation is to be considered.

Critical observation:

If 4th body bleeding to be considered for A, B&C boiling & modified juice heater bleeding pattern compared to previous case (but at higher Imbibition % fibre of 250%),the steam consumption will come down to 26 % on cane ,but the heating surfaces distribution is as below:

I -3500 M2/II -4000 M2/III – 3500 M2 -1/IV – 4000 X2 / V- 2000 M2 (total 21000 m2)

Resulting in huge heating surface in 4th effect & very less heating surface in last effect. It will effect juice distribution in last effect .Particularly in case of low crush rates these higher surfaces tends to

develop scaling problem & increase inversion also. One remedy is to cut off one of the 4th bodies at low crush rates.

Precautions to be taken:

**These measures are sensitive to fluctuations.*

**Ample Imbibition % fibre 250+ ,to be provided for effective vapour bleeding.*

**System governed by Automation needs steady state conditions.*

**For 5000 TCD &above plants need to run on minimum 70 -75% of rated capacity on TCD basis.*

**System of Automation needs trained Instrumentation Engineers & Technicians & regular training programmes on the aspect of operation & maintenance ,to upgrade the skills is a must.*

Conclusion:

The above work out based on modified configuration of evaporators with effective use of Falling film evaporators & continuous pans with modified bleeding pattern& application of various heat recovery devices such as condensate flash recovery system, Direct contact heaters & replacing medium pressure & low pressure steam applications in Super heated wash water system, Sulphur melting, Seed melting Molasses conditioning & pan washing etc. brings down the steam consumption at evaporator station considerably.

Further liberal use of floating body concepts are suggested in JH, Evaporator & pan stations to achieve efficient working & to sustain the same through out the season in case of large capacity plant , which is a basic requirement of Cogeneration plants/Integral Sugar complexes.

We have considered usage of less vacuum in last effect , to employ FFE for all effects ,to enable to boil all massecuite pans with **4th vapours** & similar rearrangement of juice bleeding gives steam saving ,which in turn produces more power ,which is beneficial to Cogeneration plants.

If we adopt 4th vapours for pan boiling ,then the heating surfaces of 3rd & 4th are large & 5th effect is very small ,creating difficulties ,when running under capacity. In that case better to cut off one of the two 4th effects from line.

Figures attached:

- 1) G.A (General arrangement) of two most popular designs of FFE .

- 2) Elevation view of VKT
- 3) Vapour & Condensate extraction system
- 4) Modified Evaporator configuration scheme (Two cases)-attached separately)
- 5) Annexure I : Heat transfer area estimation case I
- 6) Annexure II : Heat transfer area estimation case II

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Annexure I : Heating surfaces calculations for case I

Evaporation I – 68928 / II – 61246 / III –53337 / IV –11794 /V- 5224 Kgs/hr

Clear juice entering Evaporator station 253558 kgs/hr(111.21 %) @ 12.966 Bx

Calculation of leaving Brix & avg. Brix: $253558 \times 12.966 = 3287633 = x$

Sr.No	Details	Leaving Brix	Avg.Brix
I)	x/ 253568- 68928	17.81	15.39
II)	x/184640- 61246	26.64	22.22
III)	x/123394- 53337	46.93	36.79
IV)	x/ 70057- 11794	56.43	51.68
V)	x/ 58263- 5224	62	59.22
	x/ 53039		

Calculation of B.P.E/ ΔT

Heating medium	Ts (Sat .Temp)	BPE	Te	ΔT (Deg C)
Exhaust	120	-	-	-
1 st Vapour	113.5	0.33	113.83	6.17
2 nd Vapour	105	0.51	106.1	7.4
3 rd	95.5	1.09	96.59	8.41
4 th	82.5	3.5	85.8	9.7
5 th	60	7.20	67.2	15.3

Calculation of Sp. Evaporation coefficient:

- I) $0.001 (100 - 17.81) (120 - 60) = 4.9314$
 II) $0.001 (100 - 26.64) (113.5 - 60) = 3.925$
 III) $0.001 (100 - 46.93) (105 - 60) = 2.388$
 IV) $0.0009(100 - 56.43) (95.5 - 60) = 1.392$
 V) $0.0009 (100 - 62.0) (82.5 - 60) = 0.77$

Heating surface area calculation (m²):

Sr.No.	Details of calculation	Area estimated	To be provided	Remarks
I)	68928/ 6.17 x 4.9314	2265	2500 FFE	2500 x1
II)	61246/ 7.40 X 3.925	2109	2500 FFE	2500 x 2(1 spare for I &II)
III)	53337/8.41 X 2.388	2656	3000 FFE	3000x2 (one stand by)
IV)	11794/ 9.7 X 1.392	874	1000 R	1000 x 2 (one spare for IV & V)
V)	5224/ 15.30 X 0.77	444	1000 (high because of flash vapours) R	

$$\text{H.S.A/TCD Ratio} = 10000/5000 = 2.00 \text{ m}^2/\text{TCD} / 43.86 \text{ m}^2/\text{TCH}$$

Rate of evaporation:I- 27.57 /II-24.50 /III- 17.78/IV-11.80/V-5.22 Kg/m²/hr

Annexure II : Heating surfaces calculations for case II

Corresponding evaporation in kgs/hr in Quintuple :

I – 62228 / II – 58356 / III –46140 / IV – 42785 /V-3399Kgs/hr

***Calculation of leaving Brix & avg. Brix:** 266511x 12.47 =3323392 = x

Sr. No	Details	Leaving Brix	Avg. Brix
I)	x/ 266511- 62228	16.27	14.37
II)	x/204283- 58356	22.77	19.5
III)	x/145927-46140	33.30	28.04
IV)	x/ 99787- 42785	58.30	45.80

V)	x/ 57002- 3399	62	60.15
	x/ 53603		

Calculation of B.P.E/ ΔT

Heating medium	Ts (Sat .Temp)	BPE	Te	ΔT (Deg C)
Exhaust	124	-	-	-
1 st Vapour	118.5	0.25	118.75	5.25
2 nd Vapour	112	0.40	112.4	6.1
3 rd	104.5	0.6	105.1	6.9
4 th	96	1.15	97.15	7.35
5 th	85	1.67	86.67	9.33

Calculation of Sp. Evaporation coefficient:

- I) $0.001 (100 - 16.27) (124 - 85) = 3.265$
 II) $0.001 (100 - 22.77) (118.5 - 85) = 2.587$
 III) $0.001 (100 - 33.30) (112 - 85) = 1.801$
 IV) $0.0009 (100 - 58.30) (104.5 - 85) = 0.7318$
 V) $0.0009 (100 - 62.0) (96 - 85) = 0.3762$

Heating surface area calculation (m²):

Sr. No.	Details of calculation	Area estimated	To be provided	Remarks
I)	62228/ 5.25x 3.265	3630	3500	3500 x1
II)	58356/ 6.1 X 2.587	3698	4000	4000 x 1(1 spare for I &II)
III)	46140/ 6.9 X 1.801	3700	3500	3500 x1
IV)	42785/ 7.35 X 0.7318	7955	8000 (to take care of flash vapours)	4000 x 3(on8 spare for III &IV)
V)	3399/ 9.33 X 0.3762	970	2000 (to take care of flash vapours)	2000 X2 (1 std.by)

H.S.A/TCD Ratio = $21000/5000 = 4.2$ m²/TCD /92.10 m²/TCH Rate of evaporation: I- 17.78/II- 14.59 /III- 13.18 /IV-5.35/V-1.7 Kg/m²/hr

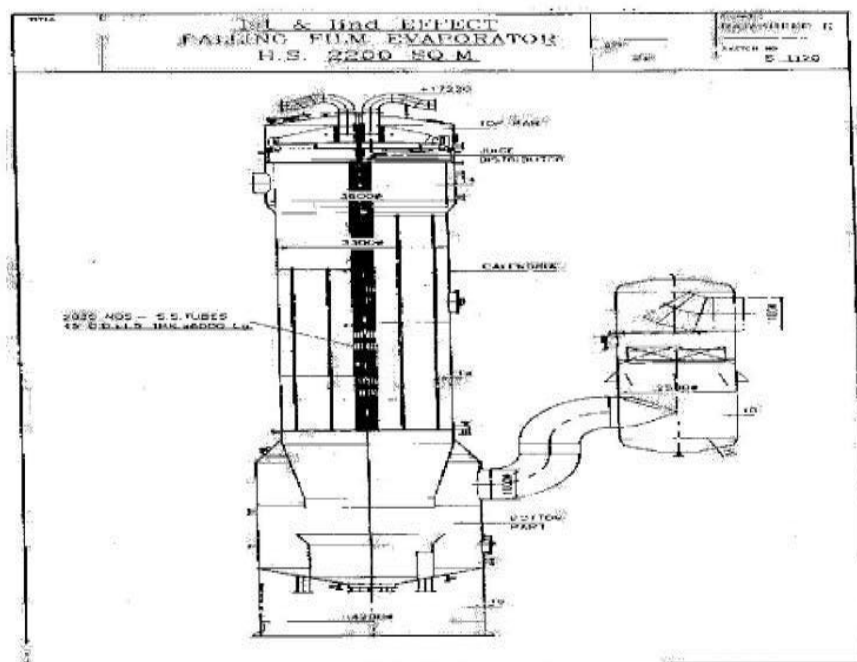


Fig. 1 -I & II Effect of Falling Film Evaporator

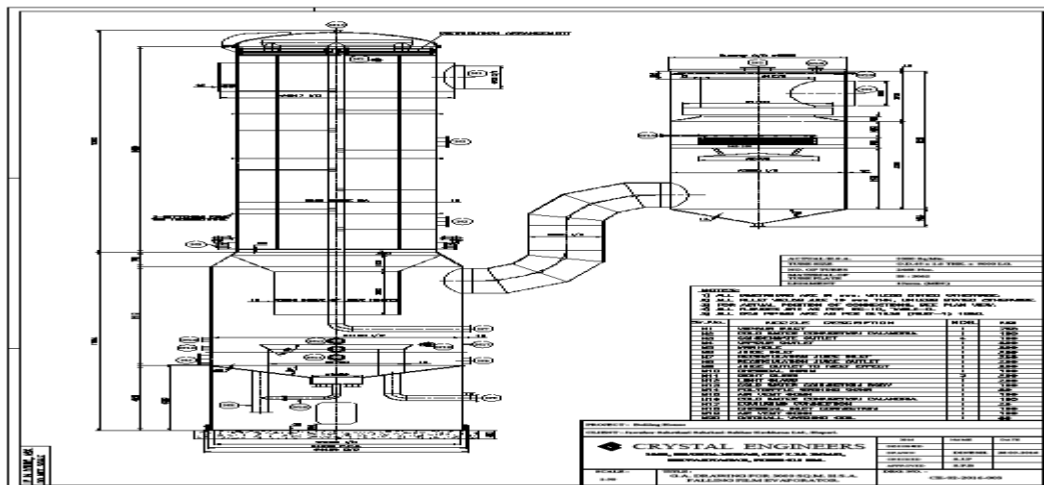


Fig. 2-Vertical Continuous Pan on A massecuite Boiling

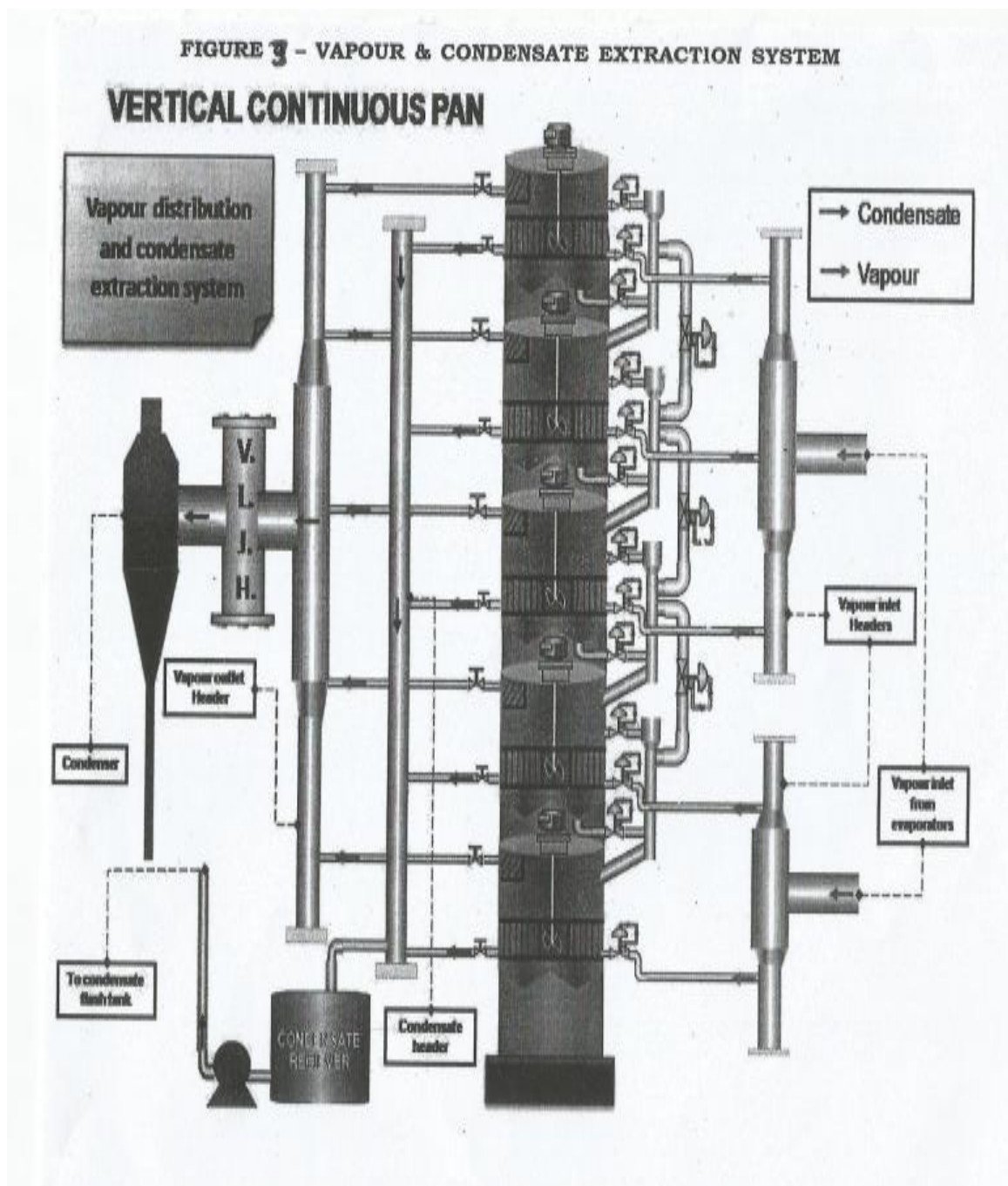


Fig. 3 – Vapour & Condensate Extraction System

ABSTRACTS:

Smarter irrigation scheduling in the sugarcane farming system using the Internet of Things by E. Wang, S. Attard, M. McGlinchey, W. Xiang, B. Philippa, A.L. Linton. & Y. Everingham published in International Sugar Journal in June, 2019.

Better irrigation practices can lead to improved yields through less water stress and reduced water usage to deliver economic benefits for farmers. More and more sugarcane growers are transitioning to automated irrigation in the Burdekin and other regions. Automated irrigation systems can save farmers a significant amount of time by remotely turning on and off pumps and valves. However, the system could be improved if it could be integrated with tools that factor in the weather, crop growing conditions, water deficit, and crop stress, to improve irrigation use efficiency.

Digitalization in sugar production – mind the foundation by Bernd Langhans published in International Sugar Journal in June, 2019.

The subject of digital disruption informed by IoT (Internet of Things) and Industry 4 is omnipresent. These technologies advance productivity gains which many owner/operators of production plants in the sugar industry acknowledge and are investing in to support the future success of their businesses. When developing an appropriate strategy, one aspect, in particular, should be taken into account: automation. It forms the

foundation for every digitalization project and is central to its success. The paper navigates through a two-stage process in which the author describes automation in the sense of an unshakable foundation for digitalization projects.

Effect of field application of three insecticides on sugarcane whitefly, Neomaskellia andropogonis: Preliminary results by Solmaz Behnam-Oskuyee, Masumeh Ziaee & Parviz Shishehbor published in International Sugar Journal in June, 2019.

A field experiment was conducted at a commercial farm in Khuzestan Province, Iran in 2016 with cane varieties IRC99-02 and CP69-1062 to elicit the efficacy three insecticides including proteus, spirotetramat, and pyriproxyfen against the sugarcane pest whitefly *Neomaskellia andropogonis* (Corbett) (Homoptera: Aleyrodidae). The experiments were conducted in a randomized complete block design with four blocks. In each block, 12 sugarcane leaves were randomly collected and the population abundance of sugarcane whitefly at different life stages was counted one day before and 3, 7, 15 and 30 days after application insecticides.

“Sleeve-Kamal” an innovative three-piece sugar mill roller for high performance and lower operating cost by Deepen Sabnis published in International Sugar Journal in June, 2019.

The paper describes and discusses SB Reshellers new three-piece roller in place of two-piece having shaft, sleeve and the top shell. It is fabricated with the inherently higher strength and modulus of elasticity of SBR Alloy2. The shaft is identical to the one conventional roller. The sleeve which is shrunk fitted over the shaft has juice channels that are entrenched during casting of the sleeve. Those can be skewed or straight i.e. parallel to axis of the shell. Both the top and bottom rollers have circumferential grooves connecting the juice channels. The geometrical arrangement of the top shell is identical to top of the roller except that it has radial nozzles fitted to extract the juice from the high pressure nip in the mill. Top shell is shrunk fitted over the sleeve having circumferential grooving and nozzles etc. The benefits of the new three-piece roller compared with conventional rollers include higher extraction efficiency, bagasse that is over 2% drier and lower cost for refurbishing shell.

The use of simulation for design and implementation of a pan station control system by S. Crouther, D. Ferraris & B. Rich published in International Sugar Journal in June, 2019.

This paper looks at the real benefits of using a dynamic simulation in the design and implementation of a pan stage control system upgrade at Kalamia sugar mill in the 2016-2017 maintenance period. This upgrade was necessary as the existing control system was isolated, aging and requiring significant changes to meet the requirements of a

concurrent project to upgrade the batch C massecuite production pan. Sim Sci DYNsIM, a commercially available simulation package, was used in conjunction with Matrikon Control Performance Optimiser to model the pan station.

Laser cladding the flanks of mill roll grooves by G.A. Kent, A. Kilpatrick, M. Eiteneuer, R.I. Letizia and N. Alam published in International Sugar Journal in June, 2019.

To reduce the costs of maintaining mill roll shells, efforts have been made to extend roll shell life and to maintain the roughness of the tips of roll grooves through a season without the need for roll arcing. Techniques for maintaining the diameter of the roll and the roughness of the groove tips have been previously developed, including tungsten carbide-impregnated hard facing and picots. These techniques for coating the tips of the grooves have a deficiency in that they do not protect the lower flanks of the grooves.

The collaborative effort between government and the private sector to reduce heavy vehicle overloading in the South African sugar industry: 2006 to 2017 by G. K. Mashile, M. Kadwa, P.W.L. Lyne & R. C. Giles published in International Sugar Journal in May, 2019.

Overloading heavy vehicles is a road safety and cost concern for both heavy vehicle owners and end users of transported products. Overloading causes premature road deterioration and increased vehicle

maintenance, and these contribute significantly to South Africa's poor road safety record. The South African National Department of Transport incorporated the campaign against overloading on its roads as a safety strategy. A self-regulating initiative called the Road Transport Management System (RTMS) was partially introduced in 2008 to address overloading in the South African sugar industry and be in line with the National Department of Transport's campaign for a road safety.

The bacterial biocontrol agent *Pasteuria penetrans* can help control root-knot nematode on sugarcane by S.A. Bhuiyan, G.R. Stirling, K. Garlick, J.M. Anderson, P. Wickramasinghe & E. Wong published in International Sugar Journal in May, 2019.

Root-knot nematode (*Meloidogyne javanica*) is one of the most damaging pests of sugarcane, often causing heavy losses in coarse-textured sandy soils. The bacterial parasite *Pasteuria penetrans* is a potentially useful bio-control agent and in a 2015–16 survey it was found at relatively high levels in three of the 126 sugarcane fields surveyed. Soil was collected from one of the heavily-infested fields and a pot experiment established to compare root-knot nematode multiplication in naturally-infested soil and in soil where the endospores of *P. penetrans* had been killed by autoclaving.

Application of machine learning algorithms in boiler plant root cause analysis: a case study on an industrial scale

biomass unit co-firing sugar cane bagasse and furfural residue at excessive final steam temperatures by R. Laubscher & Q. Engelbrecht published in International Sugar Journal in May, 2019.

The current work sets out to showcase the power of statistical learning algorithms to mine boiler operational data in an attempt to create a predictive model capable of capturing the plant-specific behaviour. The machine learning predictive model can be used to perform investigations such as: boiler diagnostics, sensitivity analysis on operational parameters and root cause analysis to determine the cause of upset/detrimental conditions. A data mining analysis was performed on an industrial scale biomass boiler co-firing sugar cane bagasse and furfural residue, which operated at excessive final steam temperatures (420–440 °C) when compared with the design steam temperature.

After four decades: a new look at ion-exchange resin at the Tongaat Hulett Refinery by M. Moodley, C. Maharaj, N. Khomo, N. Rajoo, J. Hardwick & E. Hardwick published in International Sugar Journal in May, 2019.

In November 1978, the bone char decolourisation plant at Tongaat-Hulett Refinery (Hulref) was replaced with five ion-exchange columns. This change had major benefits for the refinery in terms of chemical and energy costs, and refined sugar quality. In order to improve the liquor decolourisation, a further five secondary stage resin columns

were installed in 1987. This improved the overall decolourisation from 60 to 70%. Since 1978 the resin plant has been using the same macroporous strong base anion acrylic resin. Having a single supplier of resin for the refinery has been identified as a risk.

Color transfer into sucrose crystallized from mixed syrups by Karl Schlumbach, Maria Scharfe, Alexander Pautov & Eckhard Flöter published in International Sugar Journal in May, 2019.

The co-production of sugar from beet thick juice mixed with dissolved raw cane sugar has been undertaken for decades by different sugar companies. However, knowledge and experiences have not been shared, and research data hardly exist. In this work, sugar crystallization from mixed syrups was studied focusing mainly on the inclusion of colorants as a function of raw material variation. Evaporative crystallization was conducted for different mixed syrups. The feed syrups and crystallized sugars were analyzed in detail. It is found that colorants from different origins mutually suppress their inclusion or adhesion.

Alkalization pretreatment of thin juice supplied to weak acid cation (WAC) thin juice softening by Christopher D. Rhoten & Bernd-Christoph Schulze published in International Sugar Journal in May, 2019.

Operation of Weak Acid Cation (WAC) thin juice softening requires that concentration of lime salts in thin juice supplied to the WAC ion exchange cells be no higher than 0.100g

CaO/100DS. In the normal course of beet storage, organic acid concentration in beets increases resulting in higher lime salts concentration in thin juice. When lime salts concentration in filtered hard thin juice increases above the operational limit of 0.100g CaO/100DS, the juice must be re-alkalized with an alkalizing agent to correct the alkalinity deficiency thus reducing the lime salts concentration in thin juice supplied to the WAC units. Soda ash is generally used for the purpose of juice re-alkalization. Operation of 2nd carbonation at optimum alkalinity and correct soda ash addition results in lime salts concentration corrected to under 0.100gCaO/100DS approximating that in thin juice produced from fresh beet. Proper control of the re-alkalization process results in thin juice routinely having sufficiently low lime salts concentration for supply to the WAC softening process while also giving relatively stable pH and color behavior in juice concentration. When so supplied, the WAC softening system routinely produces soft thin juice within targeted softened juice lime salts concentration limits. Relatively precise control of both 2nd carbonation alkalinity and addition of alkalizing agent, especially during periods of fluctuating beet quality, is essential to avoid both under and over alkalization of the juice. Under-alkalization results in lime salts concentration exceeding the operational lime salts limit to the WAC units. High lime salts concentration in juice supplied to the WAC units leads to resin overloading and, in turn, to temporary reduction in effective resin capacity along with difficulty in restoring resin capacity during normal resin regeneration

cycles. Alternatively, over-alkalization, in spite of yielding sufficiently low limesalts concentration to the WAC units, leads to pH and color increase during juice concentration.

Installation of VL1300 prototype low grade fugal by K. Selby, I. Rose & G. Vidler published in International Sugar Journal in April, 2019.

The Condong Mill No. 2 low grade fugal basket was condemned during the 2015 crushing season after developing high vibration due to excessive run-out of the top rim. When replacement options were being investigated an opportunity was provided by Western States to install a prototype VL1300 low grade fugal on the proviso that they could conduct performance trials. This paper discusses the installation, commissioning and operation of the fugal. Details of teething issues, their cause and resolution are provided. The fugal uses an innovative probe-fed centre-feed design to obtain very good massecuite distribution across the separating screen.

Field screening of sugarcane varieties for resistance to the pink stalk borers *Sesamia* spp. (Lepidoptera: Noctuidae) in Iran by Amin Nikpay, Francois-Regis Goebel & Peyman Sharafizadeh published in International Sugar Journal in April, 2019.

To assess damage from the pink stalk borers *Sesamia* spp, a field trial was carried out during 2013-2014 and 2014-2015 growing season at Salman Farsi Agro-industry Farms Iran in a randomized block design with four

replications. In this experiment, the resistance of 15 sugarcane varieties including IRC99-04, IRC99-05, IRC99-06, IRC00-10, IRC00-11, IRC00-12, IRC00-13, IRC00-14, IRC00-15, IRC00-16, IRC00-17, IRC00-18, IRC00-19, IR-21 and IR-31 on stalk borers was evaluated.

Breeding new sugarcane varieties with enhanced ratooning ability by K.A. Gravois, M.M. Zhou, H.P. Hoffmann, G. Piperidis & G. Badaloo published in International Sugar Journal in April, 2019.

Sugarcane crop-cycle length and yield are largely determined by the ratoon crops and drive economic returns for farming operations. A number of factors affect ratooning ability (RA – the percent of the second-ratoon crop yield to the plant-cane crop yield). The transition from manual harvest to mechanized harvest in many industries has had a negative effect on RA, and most agree that the variety component is the key to improving RA. Thus, it is paramount that sugarcane breeding programs set RA as a high priority.

Comparison between bin tonnages and yield monitor predictions by T.A. Jensen & A.G. Garmendia published in International Sugar Journal in April, 2019.

This paper details the investigation undertaken to track harvested cane from the field to the mill and to compare this information with yield monitor data. The testing was conducted late in the season in the Childers region in 2016. The harvester

evaluated was a 2015 model John Deere 3620 that had been equipped with both a prototype yield monitoring system (Jensen et al., 2013) and a JD yield monitor. Only cane that was cut into haulouts that were a straight tip into the rail wagons was tracked. No topping up of bins was permitted.

Chokeless Hood for Cane Chopper at NSL Sugar Unit-II by Aland P. Devarajulu published in 76th Annual Convention of STAI in 2018.

Small developed lead to major advantage of cane feeding, thus a chokeless-hood has been adopted for chopper to avoid jamming and maintain uniform feeding instead of kicker. Cane carriers jamming stoppages are tremendously reduced without major investment like for installing kicker etc. Additional to that power consumption/maintenance reduced.

DCH for Super-Heated Wash Water System by P.B. Deshmukh published in 76th Annual Convention of STAI in 2018.

In batch type centrifugal super-heated wash water system is used. In our sugar factory super-heated wash water's temperature remains 102°C. For proper sugar washing temperature of wash water more than 110°C is essential and so, a DCH has been designed.

Innovative Solutions for Upgradation of Mills by J.K. Kharbanda, Ranjeet Ingale & K.P. Vasanthan published in 76th Annual Convention of STAI in 2018.

The technology of juice extraction through mill rollers has a history of more than 150 years. There are many sugar plants which are still operating with the older headstocks of even 70 years & above. Even many plants are using conventional methods of drive arrangements like steam turbines & combined drives. Nowadays there is need of plant capacity enhancement to improve extraction efficiency, utilize higher cane availability, and meet out the global sugar demand and to reduce the crushing period. There is myth in sugar industry if the capacity needs to be increased then there is need of complete new mill or tandem with civil foundation, drive and all other accessories. But ISGEC has broken the myth by introducing innovative ways of low cost refurbishment solutions to existing milling tandem. This paper discusses three such cases which have successfully refurbished in last year. Those are RSSC-Swaziland, Jayawant sugars-Maharashtra & Indian sucrose-Punjab.

Multi-Level Inverter based Topologies for Sugar Mill Drive Applications by Anoop Kumar Kanaujia, Sanjiv Kumar & D. Swain published in 76th Annual Convention of STAI in 2018.

In this paper, MLI (Multi-Level Inverter) systems for mill drives employing induction motor are discussed. The open-end winding based MLI topologies; both ends of three-phase induction motor are fed by two dissimilar or same types of inverter and more accepted because of the number of advantages as compared to the conventional MLI

topologies. The open-end winding configuration of an induction motor drive can be controlled by low switching frequency and found proficient to generate output voltage waveform with better harmonic profile. This makes OEWIM drive configurations suitable for high voltage and high power mill drive applications. A range of open-end winding structure MLI topologies consisting different PWM (Pulse-Width Modulation) switching schemes have been proposed by the researchers so far. In this paper, the performance of OEW based inverter for an induction motor has been discussed based on the simulation technique

Phase wise reduction in steam consumption from 52% on cane to 40% on cane at Rauzagaon Chini Mills by Pankaj Shahi & Manoj Kumar Upreti published in 76th Annual Convention of STAI in 2018.

Rauzagaon Chini Mills is the first sugar refinery of north India. The plant is having Defeco melt phosphotation process of melt clarification followed by IER columns for decoloration of clarified melt and produces refined sugar of Average 24 IU and the bold grain percentage remains more than 90 % of total sugar production. The L-31 grade production remains around 55 % of total production. Up to Season 2014-15 plant was operating at 50-52 % steam consumption for the day and season average in range of 55-56 % on cane but in the current era of Cogeneration it was considered as very high therefore management decided to do phase wise modification in the plant with a target to

bring the steam consumption up to 43 % in the first stage and finally up to 40 % in the second stage without compromising in quality. The paper describes about the original system and phase wise modifications done to achieve the targeted steam consumption % cane.

Steam Economy in Existing Plant at Jawahar S.S.K. – A Success Story by Manohar Gopal Joshi, Sanjay Awasthi, Anurag Goyal & Deepti Mishra published in 76th Annual Convention of STAI in 2018.

Performance of a plant is defined by; i) Overall Recovery, ii) Steam Consumption, iii) stoppages & average crush rate, iv) overall efficiencies. Steam consumption is inversely proportional to the crush rate; lower the steam consumption more will be the crushing capacity of plant with same amount of steam available. This is the reason, Sugar plants are intends to minimize their steam consumption but without compromising over sugar losses or overall sugar recovery. Jawahar SSK, Hupari is one of those sugar plants. Management of plant took the initiative to drop down their steam consumption in two phases: 41.26 % to 38.95 % on cane in phase I and 38.95% to 32.87% on cane in phase II, to increase the plant capacity without investing in steam generation plant.

Sugar Industry: A hub of useful bio-based chemicals by Priyanka Singh, J.Singh and S. Solomon & published in Indian Sugar Journal in May, 2019.

Sugarcane, being a C4 plant, is an excellent source of converting solar energy into biomass. Apart from sugar, sugarcane is a wonderful source of fibre, fodder, fuel and many chemicals. Sugarcane could synthesize a huge number of useful compounds and store them. The chemicals include sucrose, reducing sugars, polysaccharides, wax etc. These chemicals can be obtained commercially from the crop. Besides extracting sucrose, the principal product, the by-products of processing like bagasse, molasses, press-mud, etc., being rich in carbon compounds and minerals provide ample opportunity for extraction per se, physico-chemical transformation or microbial fermentation to value-added products like pharmaceuticals, fermentation or enzyme substrate for production of valuable chemicals, new food/feed products medicines, pesticides, etc. In India, on an average processing of 100 tonnes of sugarcane in a factory yields 10 tonnes of sugar, 30-34 tonnes of bagasse, 4.46 tonnes of molasses, 3 tonnes of press mud, 120 tonnes of flue gases and 1500kWh of surplus electricity.

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